dRICH parameterisation

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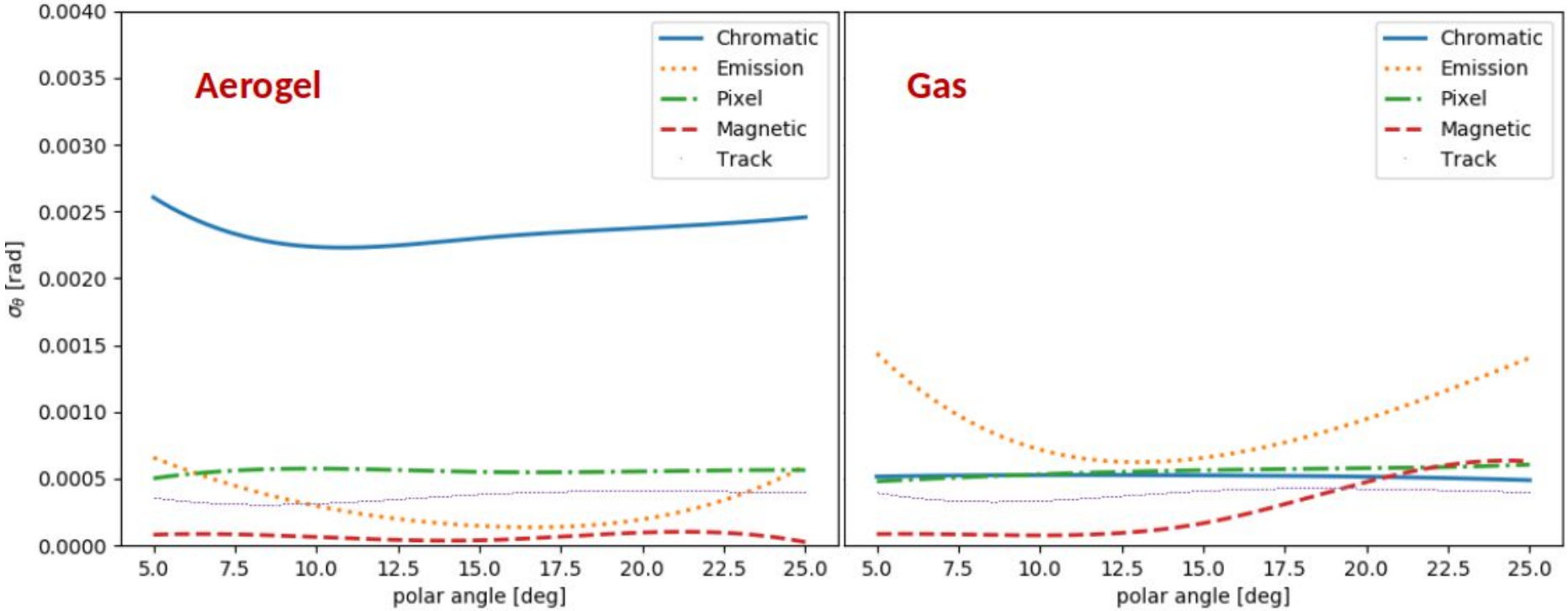
Description of the model and parameters

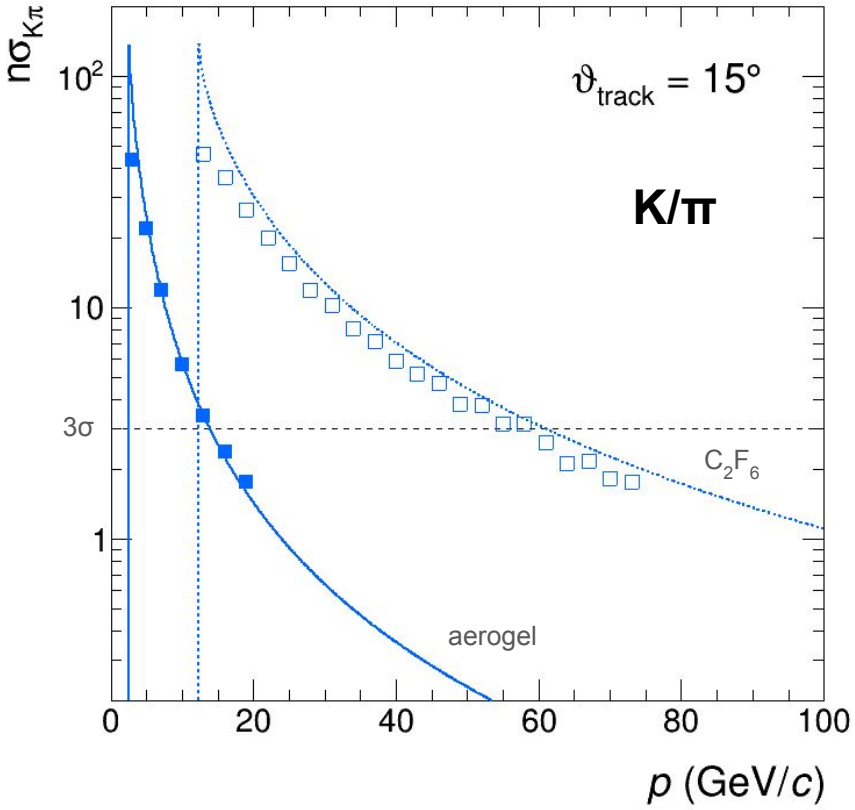
- **geometrical acceptance**
  - distance from the interaction point — $D = 250$ cm
  - inner radius from the beam pipe — $R_{min} = 10$ cm
  - outer radius from the beam pipe — $R_{max} = 120$ cm
- **Cherenkov radiator**
  - refractive index — $n = 1.02$ (aerogel) 1.0008 (C_2F_6)
  - length of the radiator — $L = 4$ cm (aerogel) 160 cm (C_2F_6)
- **Cherenkov ring**
  - Cherenkov angle — $\cos\theta_{ch} = 1 / n\beta$
  - number of emitted photons — $N_{ph} = 490 \sin^2\theta_{ch} L$
  - overall photodetection efficiency — $\varepsilon_{ph} = 8\%$ (aerogel) 15% (C_2F_6)
    - to match MC at $\beta = 1$ — $N_{pe} = 6$ (aerogel) 20 (C_2F_6)
  - minimum number of photoelectrons — $N_{min} = 3$
- **angular resolution**
  - single-photon resolution — $\sigma^2_{pe} = \sigma^2_{chrom} + \sigma^2_{emission} + \sigma^2_{pixel} + \sigma^2_{field} + \sigma^2_{tracking}$
    - ϑ_{track}-dependence from MC — next slide
  - total resolution — $\sigma^2 = \sigma^2_{pe} / N_{pe}$

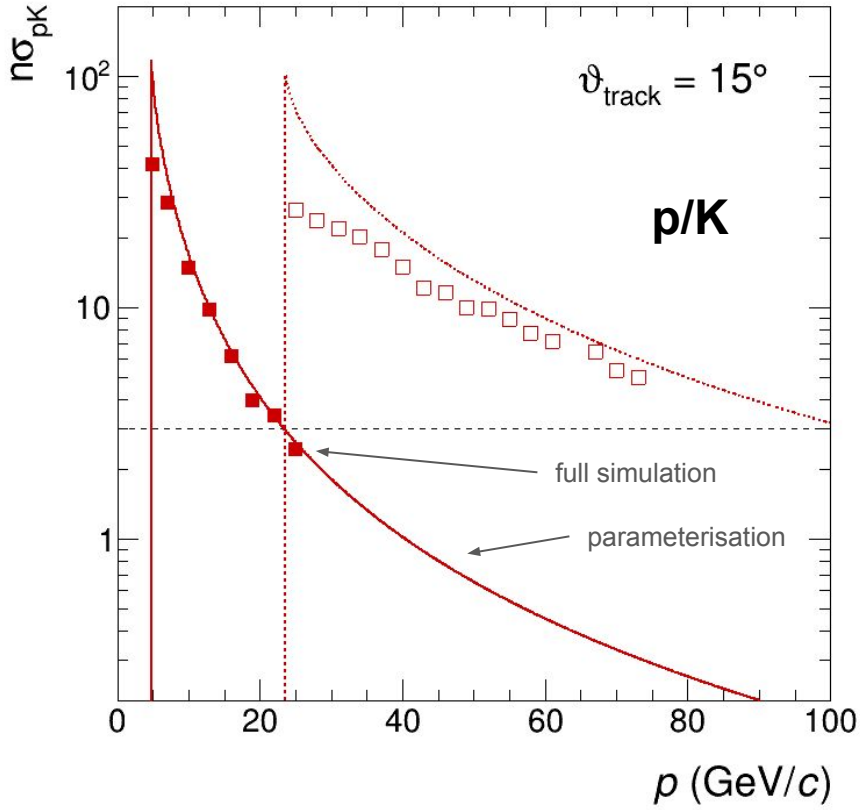
Cherenkov angle resolution

as function of the track polar angle, taken from Monte Carlo simulations

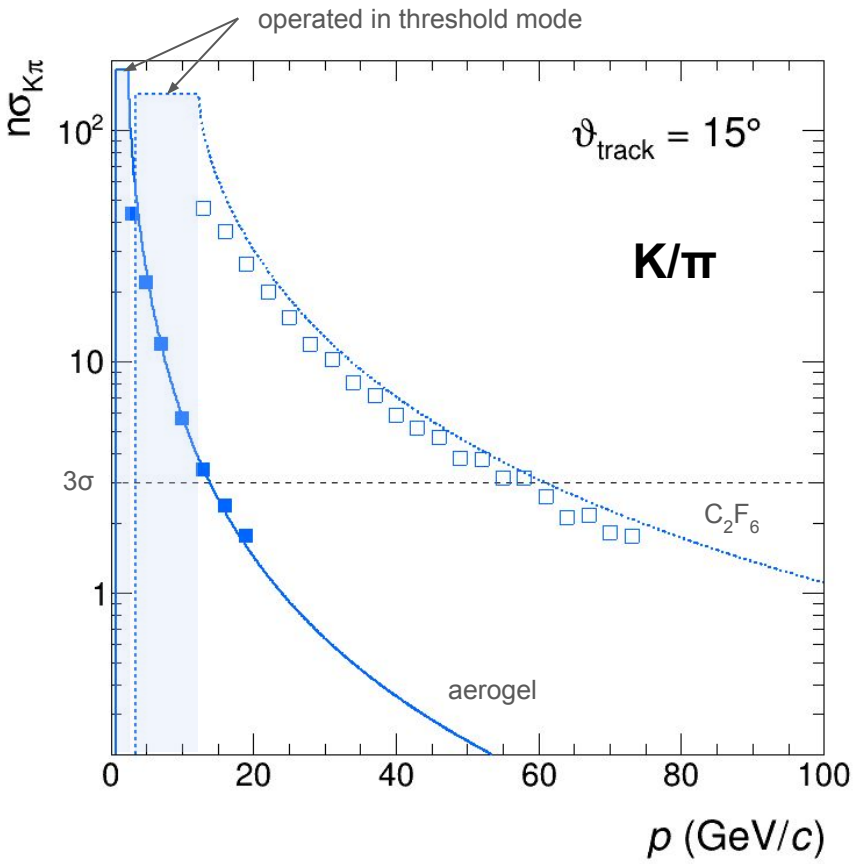


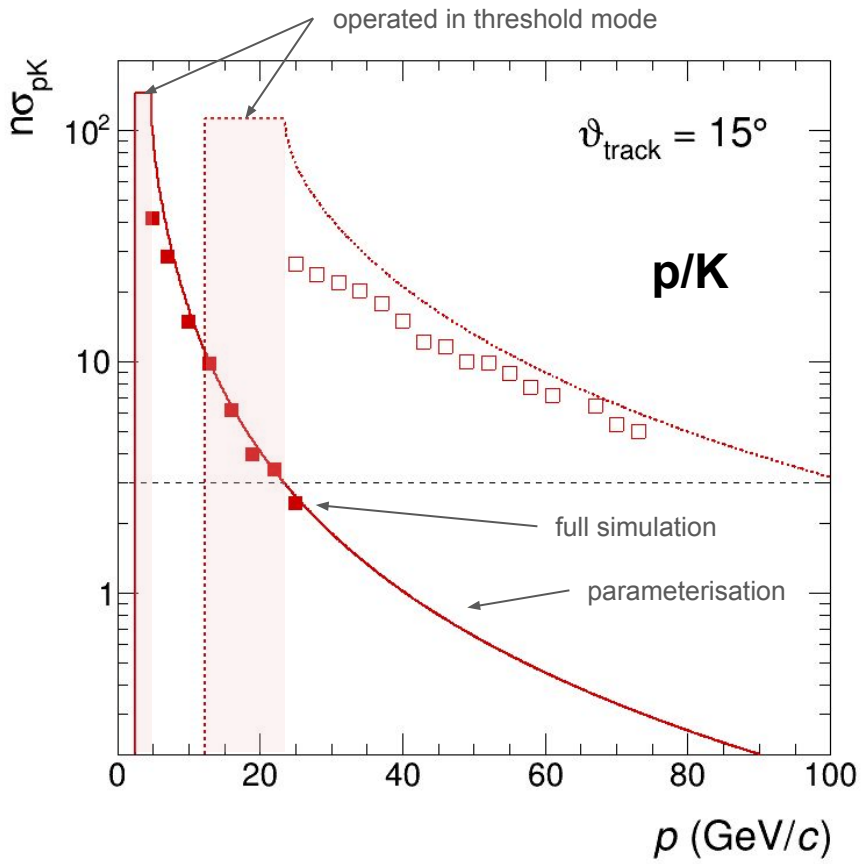
Some plots





K/π and p/K separation as a function of momentum





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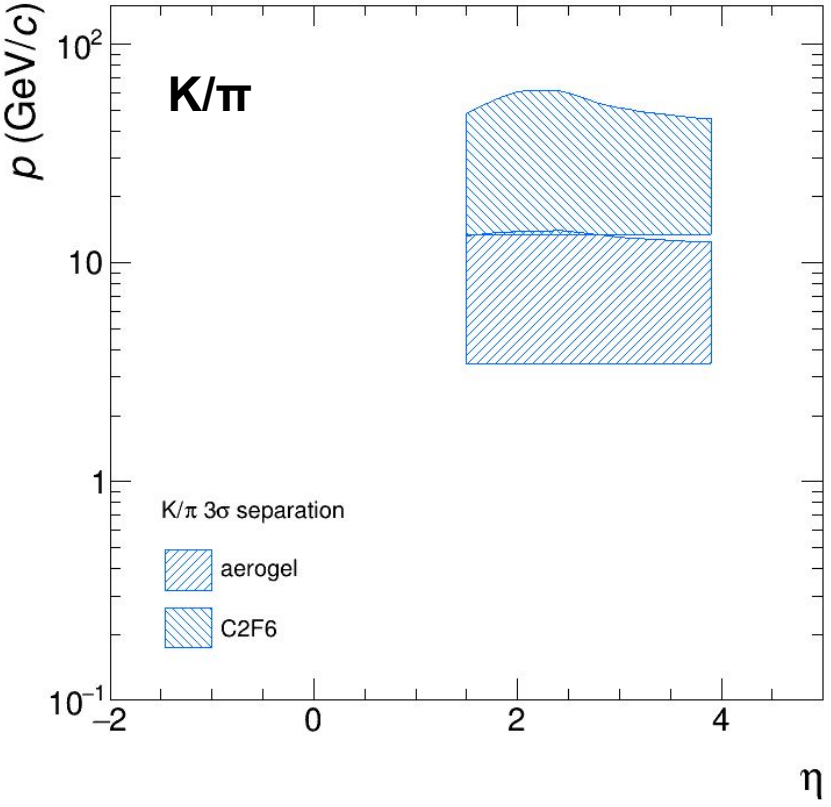
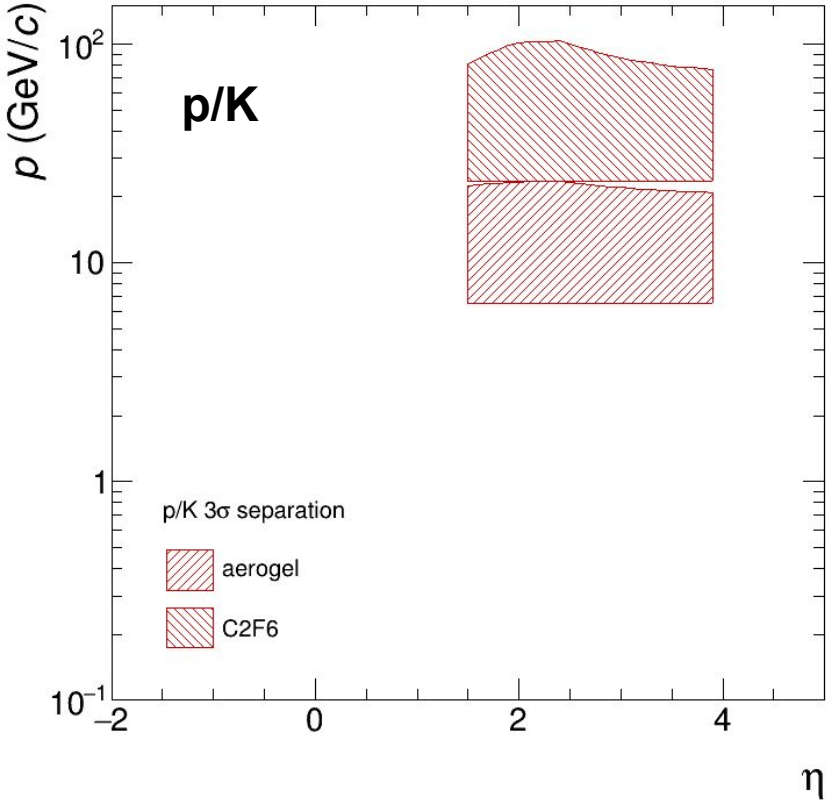
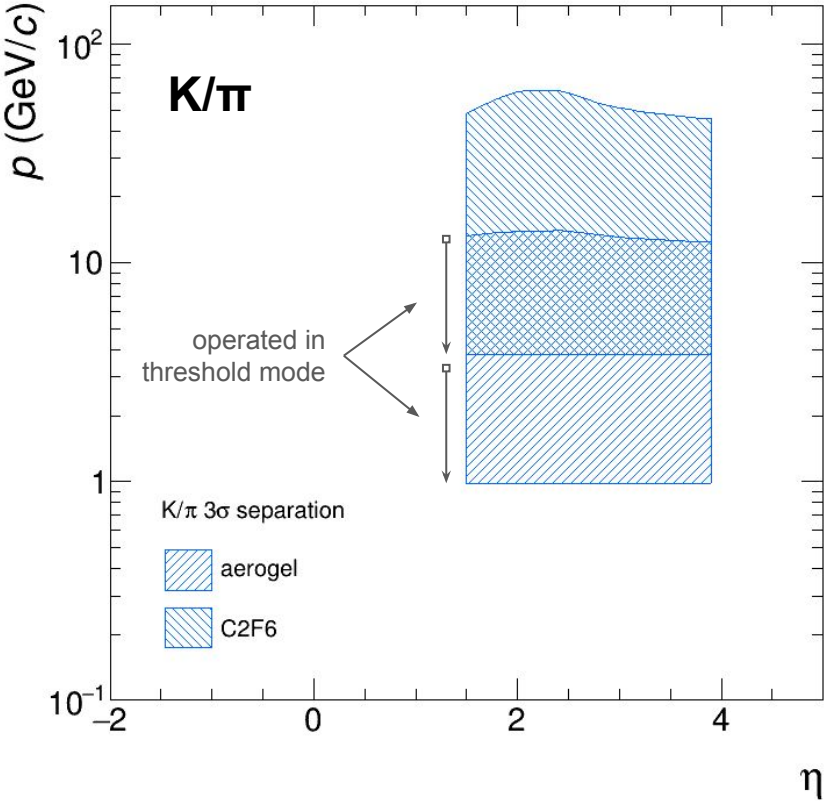
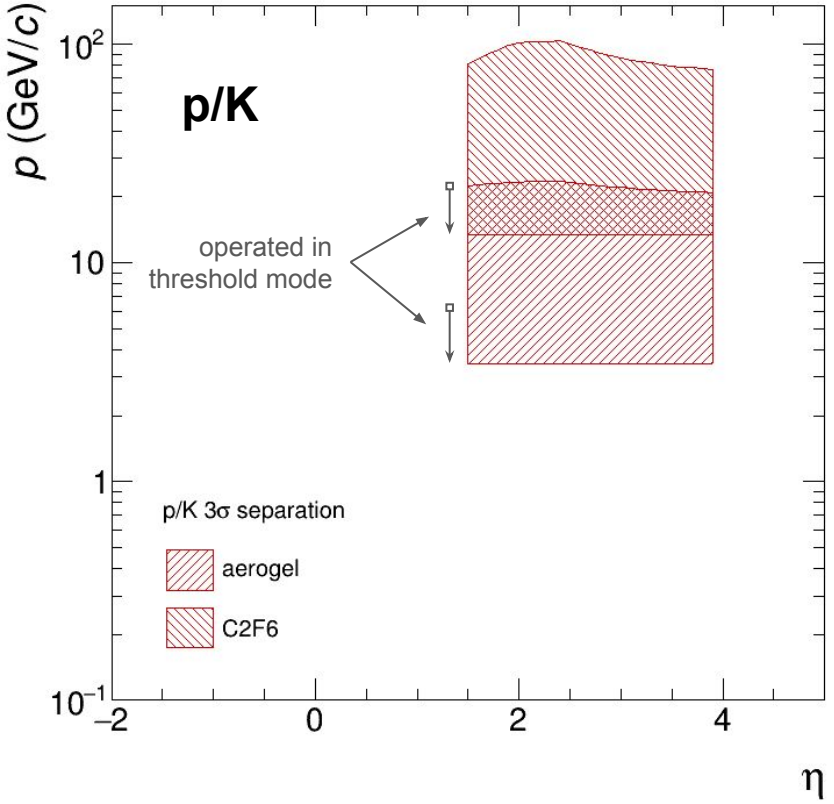




Acceptance and momentum ranges with PID better than 3σ





Acceptance and momentum ranges with PID better than 3σ

$$n - 1 = \frac{2.50141 \times 10^{-3}}{91.012 - \lambda^{-2}} + \frac{5.00283 \times 10^{-4}}{87.892 - \lambda^{-2}} + \frac{5.22343 \times 10^{-2}}{214.02 - \lambda^{-2}}$$

Ar at 1 bar, with λ expressed in μm

$(n-1)_1$ = 0.000294 for λ = 310 nm (typical MAPMT + F-T)

$\sigma_{chrom,1}$ = 0.4 mrad

Ar at 3.5 bar

$(n-1)_{3.5} / (n-1)_1 = 3.5$

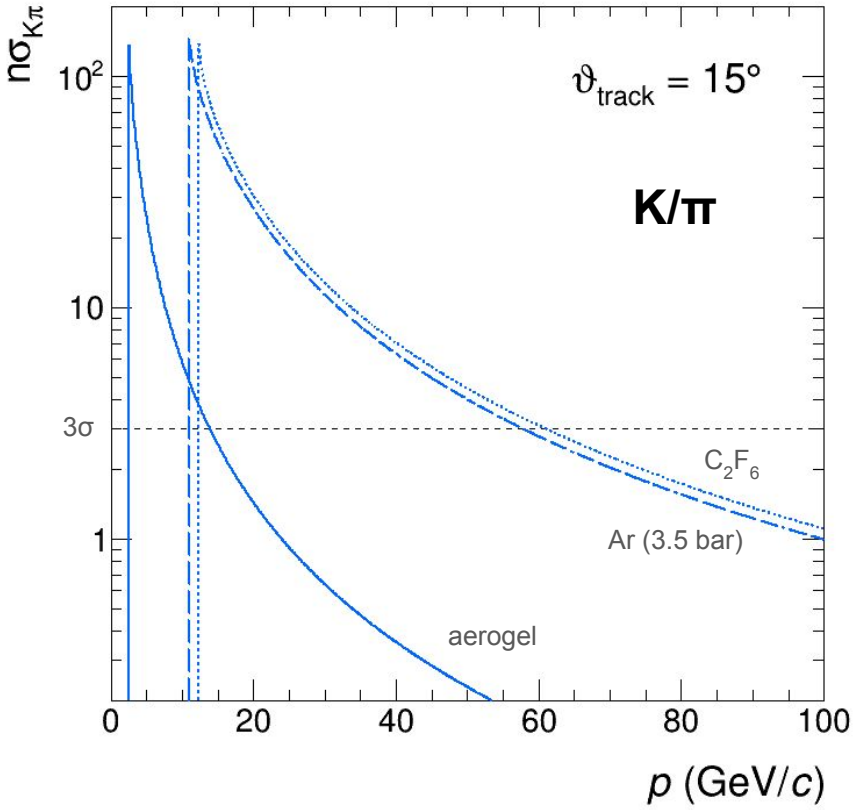
$\sigma_{chrom,3.5} / \sigma_{chrom,1} = \theta_{ch,max,3.5} / \theta_{ch,max,1} = 1.87$

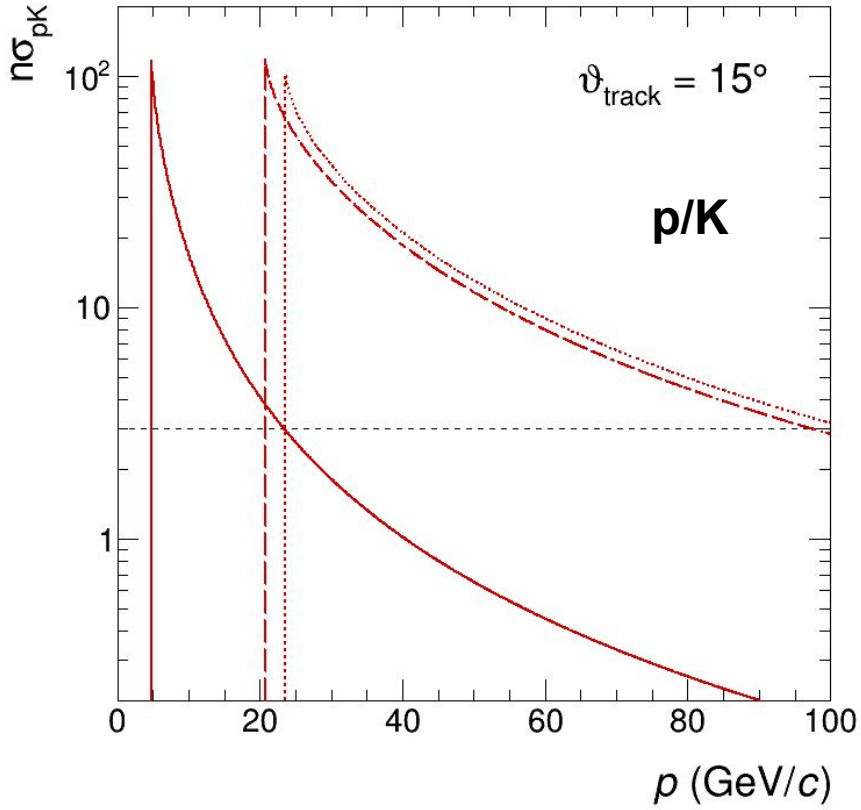
Ar @3.5 bar radiator

n = 1.00103

σ_{chrom} = 0.75 mrad

With identical parameters, besides **refractive index** and **chromatic dispersion**





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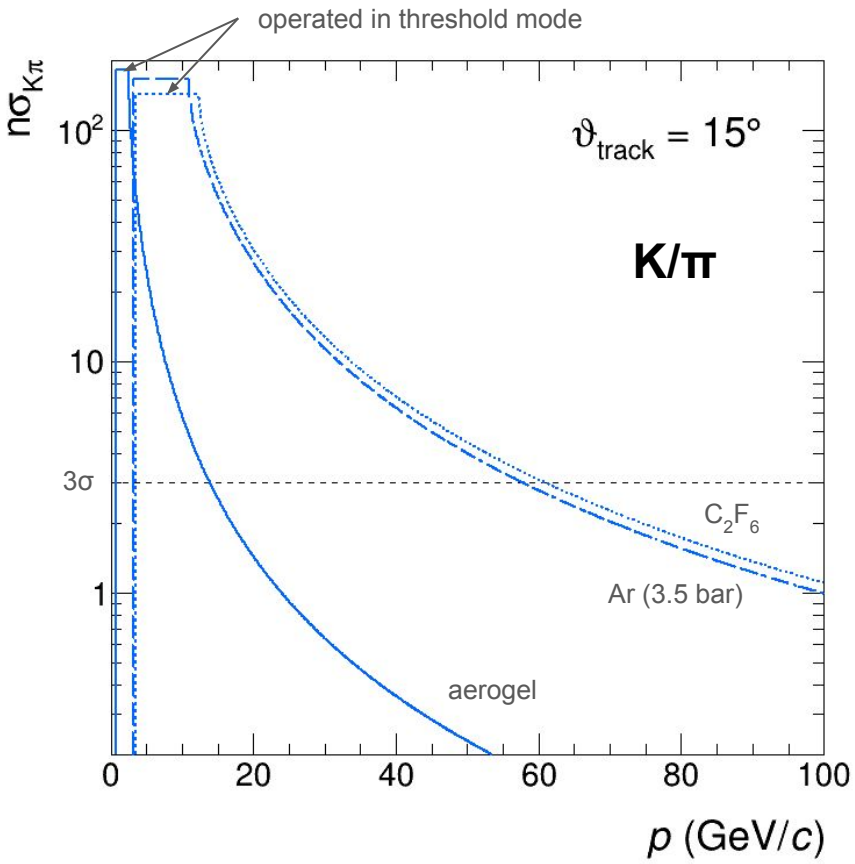

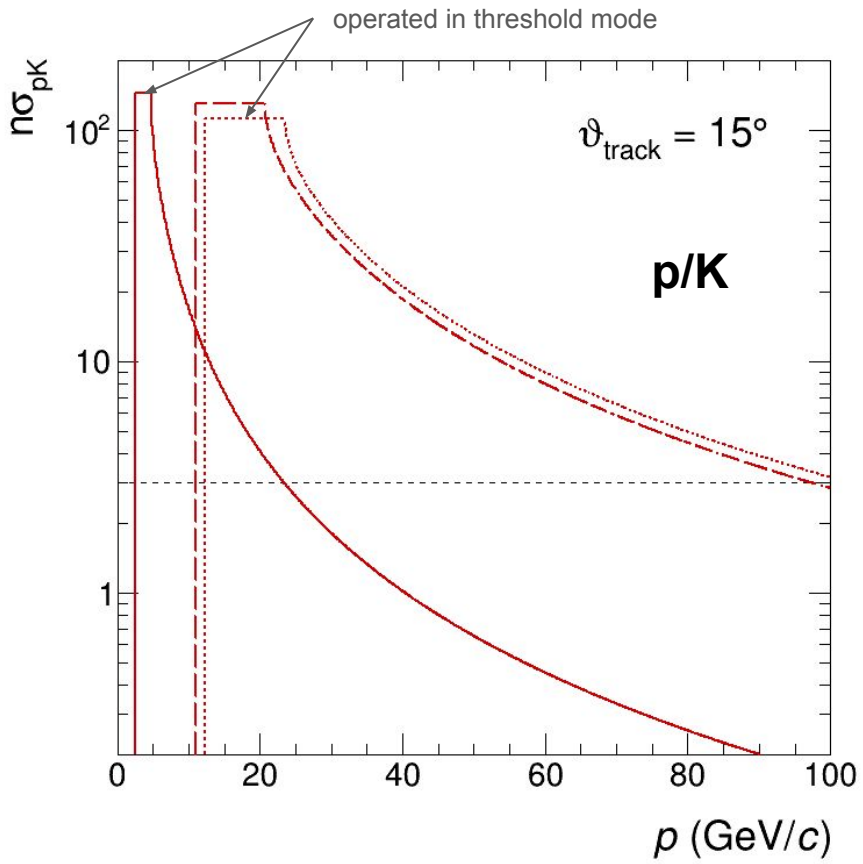

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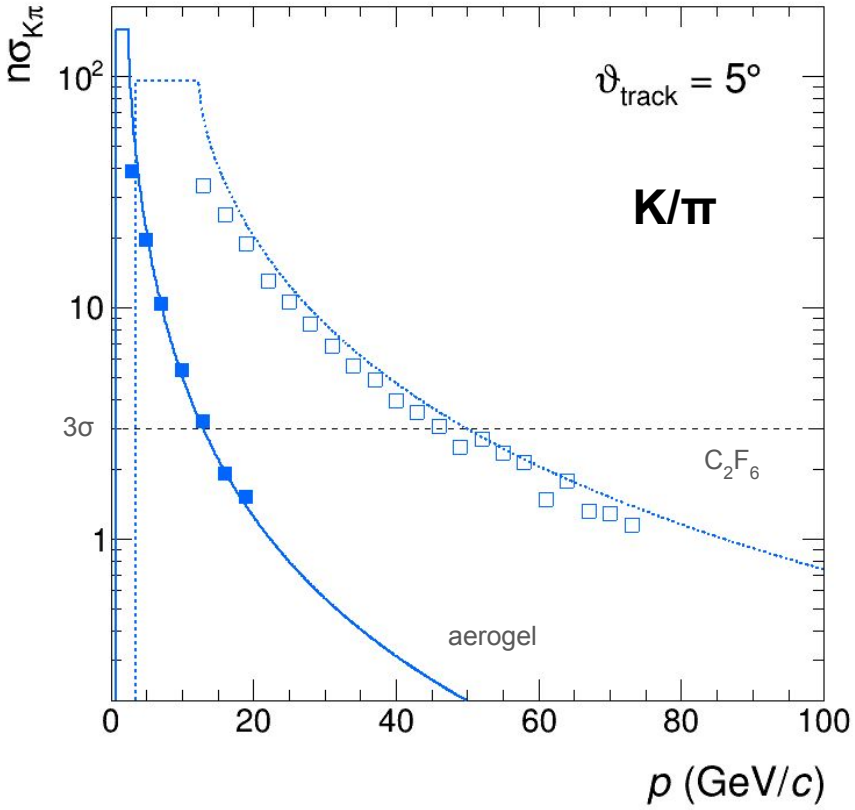
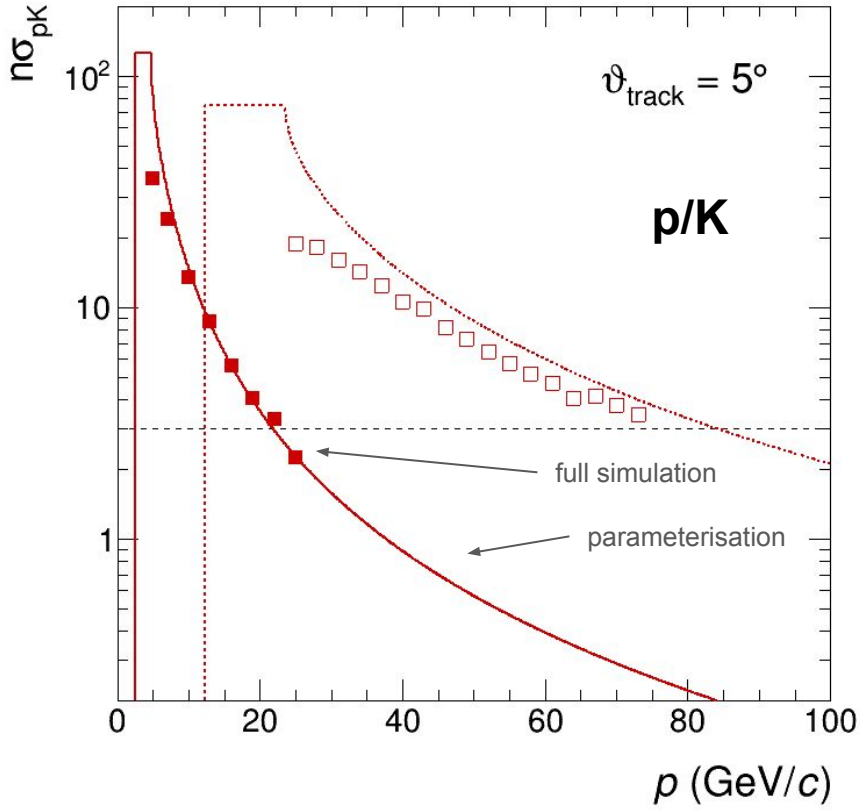
More plots





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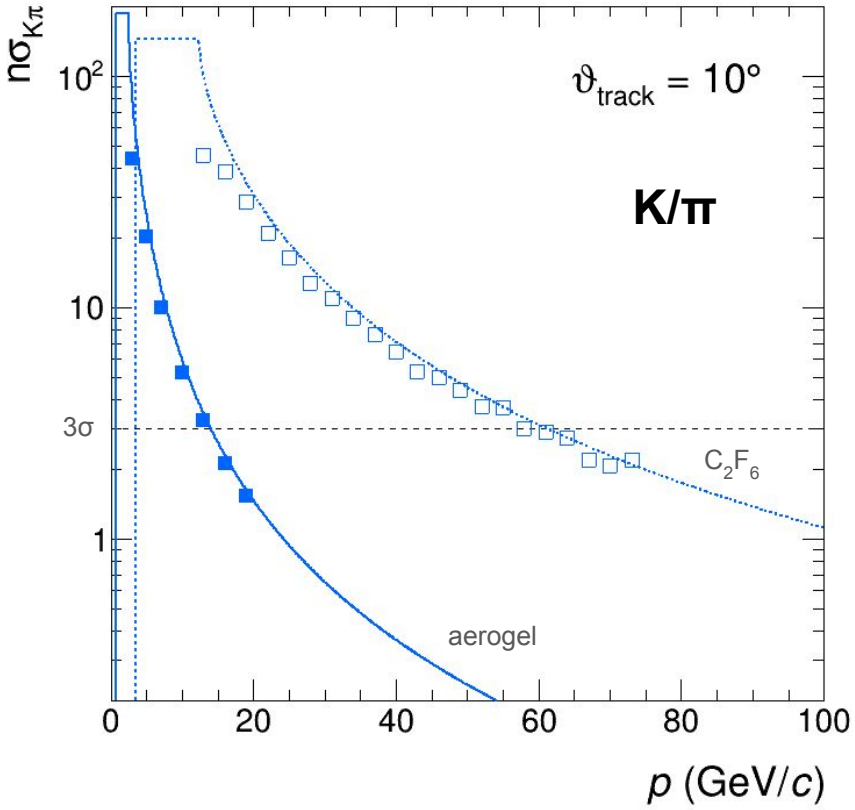

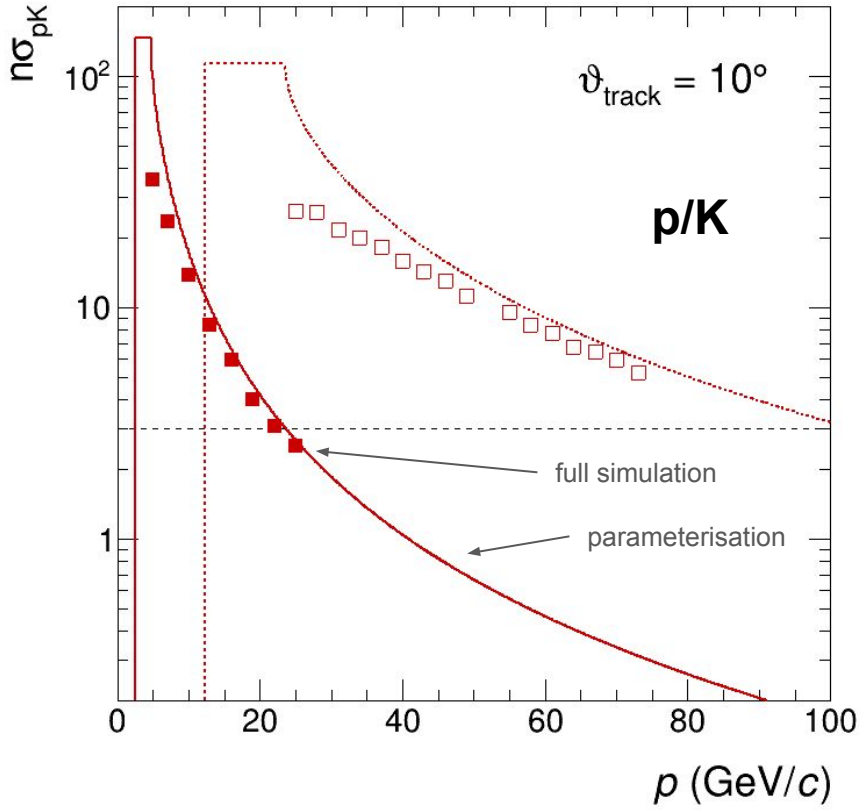

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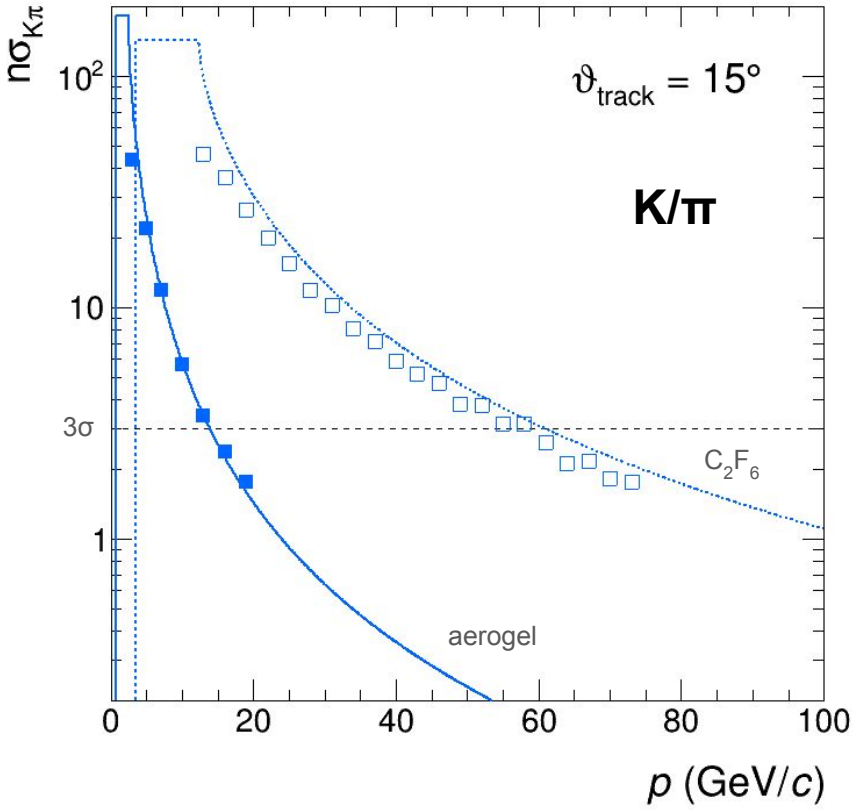

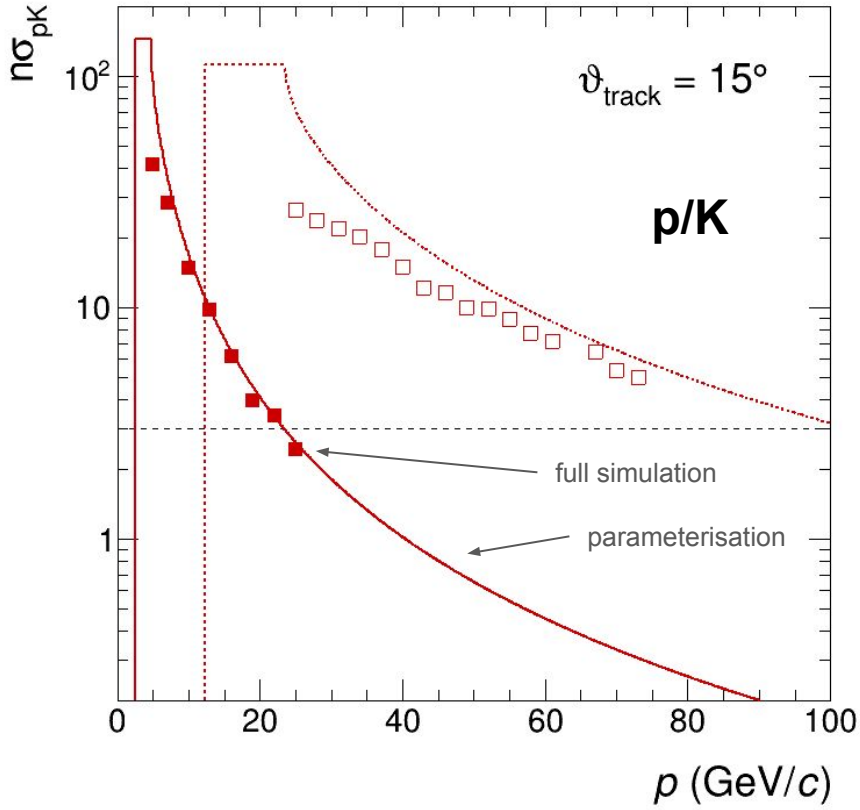

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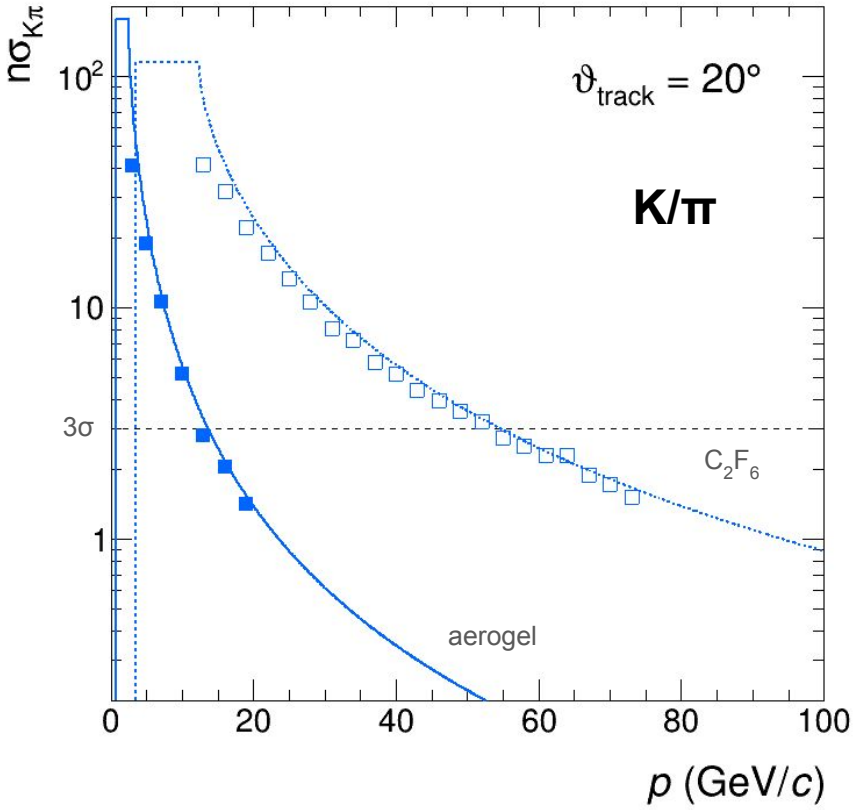

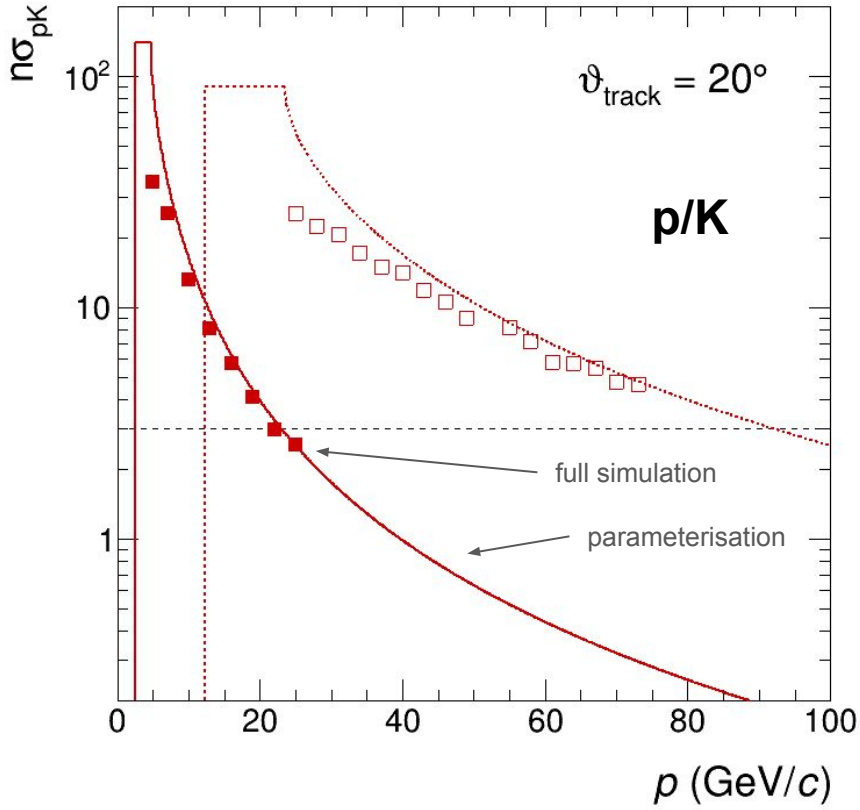

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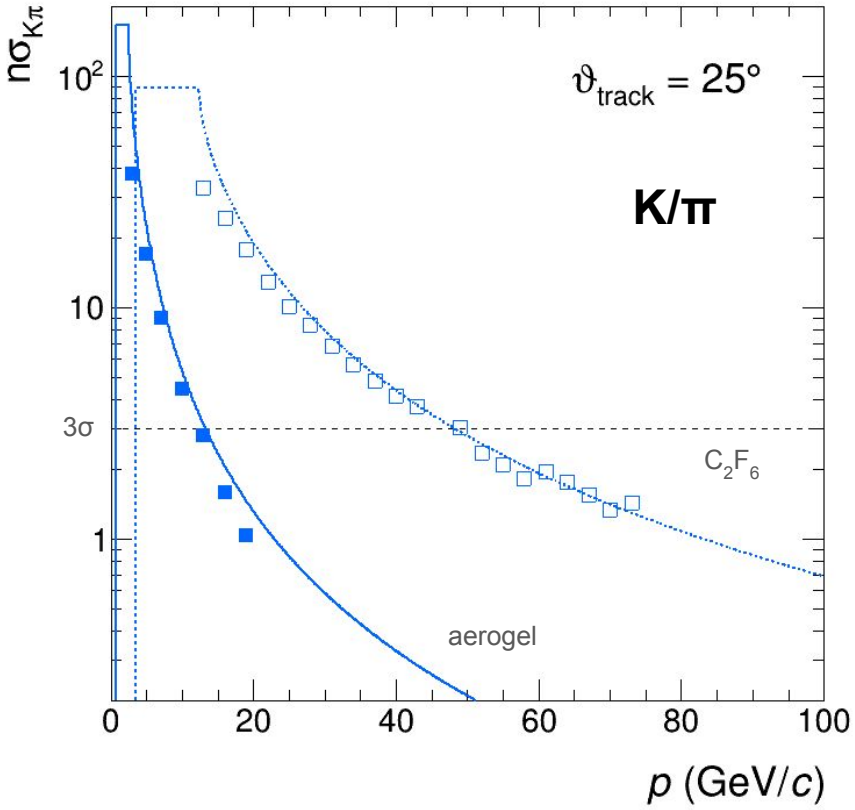

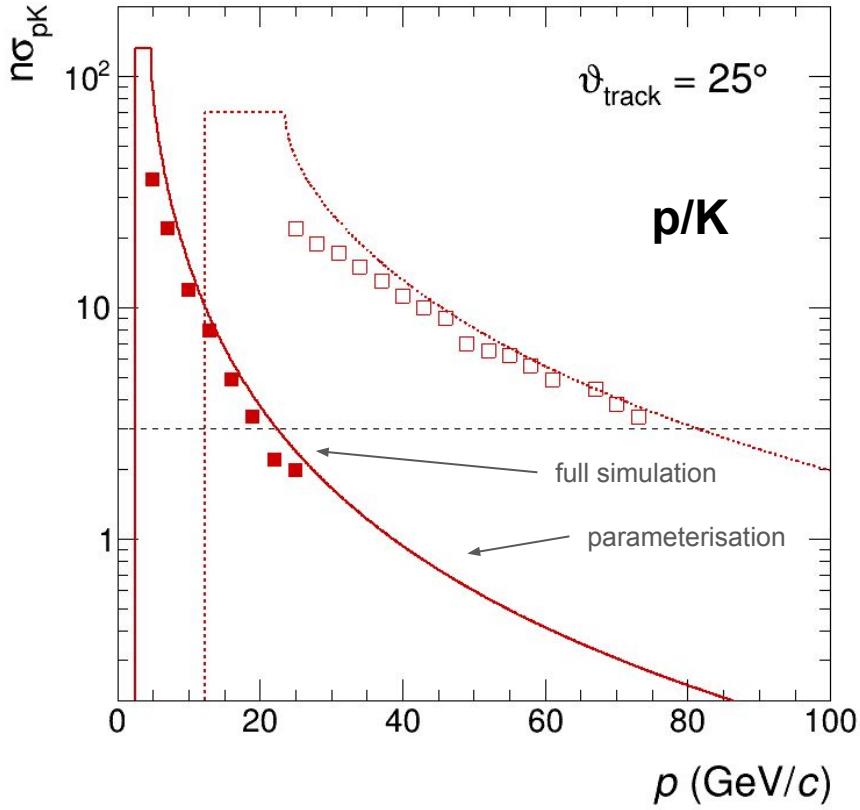

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